REMARKS

The Office Action mailed November 15, 2004 has been carefully reviewed and the foregoing amendments have been made in consequence thereof.

Claims 1-19 are now pending in this application. Claims 1-19 stand rejected.

The rejection of Claims 1, 4-6, and 9-17 under 35 U.S.C. § 102(b) as being unpatentable over Coronel (U.S. Patent No. 4,333,309) is respectfully traversed.

Coronel describes a gas turbine engine 10 including a steam boiler assembly 75 that consists of metal tubing wrapped around a combustion burner casing 75. The boiler assembly heats a liquid to a steam state and facilitates cooling the combustion chamber walls. Steam produced in the boiler is directed to a steam drive nozzle 140 which channels the steam through progressively increasing steam power turbine wheels 100. Steam exiting the steam power turbine assembly is channeled into a steam passage corridor 35 and routed to a compressor-condensor wheel assembly 15 wherein the steam is condensed and used to provide heat to engine components to facilitate preventing the formation of ice during engine operation. The condensed liquid exits the engine by flowing through a condensate line 55 to filters and pumps operated by an accessory drive shaft 150.

Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

Coronel does not describe nor suggest a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, Coronel does not describe nor suggest coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface. Rather, in contrast to the present invention, Coronel describes utilizing a steam boiler assembly to facilitate preventing the formation of ice during engine operation, wherein the steam boiler assembly uses metal tubing that is configured such that fluid flows only in one direction therethrough within the ice protection system. Accordingly, Claim 1 is submitted to be patentable over Coronel.

Claims 4 and 5 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 4 and 5 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 4 and 5 likewise are patentable over Coronel.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Coronel does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Coronel does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second

end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Coronel describes utilizing a steam boiler assembly to facilitate preventing the formation of ice during engine operation, wherein the steam boiler assembly uses metal tubing that is configured such that fluid flows only in one direction therethrough within the ice protection system. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Coronel.

Claims 9-12 depend, directly or indirectly, from independent Claim 6. When the recitations of Claims 9-12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claims 9-12 likewise are patentable over Coronel.

Claim 13 recites a gas turbine engine comprising "a stator assembly...an ice protection system comprising at least one heat pipe coupled in thermal communication between said heat source and said stator assembly outer surface...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation."

Coronel does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 13. More specifically, Coronel does not describe nor suggest at least one heat pipe coupled in thermal communication with a stator assembly outer surface, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Coronel describes utilizing a steam boiler assembly to facilitate preventing the formation of ice during engine operation, wherein the steam boiler assembly uses metal tubing that is configured such that fluid flows only in one direction therethrough within the ice protection system. For at least the reasons set forth above, Claim 13 is submitted to be patentable over Coronel.

Claims 14-17 depend, directly or indirectly, from independent Claim 13. When the recitations of Claims 14-17 are considered in combination with the recitations of Claim 13, Applicants submit that dependent Claims 14-17 likewise are patentable over Coronel.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 4-6, and 9-17 be withdrawn.

The rejection of Claims 6 and 12 under 35 U.S.C. § 102(b) as being unpatentable over Crouch et al. (U.S. Patent No. 6,027,078) is respectfully traversed.

Crouch et al. describe an engine nacelle 12 including a localized heating system 38. The nacelle includes controlled and uncontrolled airfoil surfaces 18 and 20, respectively. The heating system includes a heat source 40 that is located at a lip 26 of the nacelle and a heat sink 42 that is downstream from the heat source and is adjacent the controlled airfoil surface. In the preferred embodiment, the heat source 40 is an electro-thermal heat source located within the nacelle lip, and the heat sink is a heat pipe 52 that is positioned within, and substantially fills, the nacelle aft of the heat source. The cavity defined within the heat pipe contains a vaporizing agent 60 that evaporates during engine operation and moves radially outwardly to a cooler region 56 of the heat pipe. The agent is condensed and absorbed into wicking material 58. Specifically, Crouch et al. describe that the transfer of heat by the heat pipe encourages laminar flow along the nacelle controlled surface, and thus improves nacelle boundary-layer airflow.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Crouch et al. do not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Crouch et al. do not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Crouch et al. describe utilizing heat pipe to pipe encourage laminar flow along the nacelle controlled surface, and thus improve nacelle boundary-layer airflow. Moreover, Crouch et al. do not describe that fluid flows in a first direction from the heat pipe first end to the second end therethrough and in a second direction from the heat pipe second end to the first end therethrough during engine operation, but rather, Crouch et al. describe that fluid flows radially between opposite sidewalls of the heat pipe rather than between the heat pipe ends. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Crouch et al.

Claim 12 depends from independent Claim 6. When the recitations of Claim 12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claim 12 likewise is patentable over Crouch et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 6 and 12 be withdrawn.

The rejection of Claims 6 and 9-12 under 35 U.S.C. § 102(6) as being unpatentable over Martin (U.S. Patent No. 2,709,892) is respectfully traversed.

Martin describes de-icing protection for a jet engine including a generator 1. The generator uses circulating liquid as a coolant. More specifically, a piece of continuous tubing has an inlet leg 12 coupled to the generator at 13 and an outlet leg 6 coupled to the generator at 14. The inlet and outlet legs are coupled together at an apex 15 such that a loop of tubing is formed, wherein the majority of the tubing is positioned within an inlet guide vane 3.

During operation, as the liquid coolant is heated by the generator, it is channeled out the outleg leg, through the loop of tubing, and back into the generator through the inlet leg 6. The heat transfer from the tubing facilitates de-icing the jet engine.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Martin does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Martin does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Martin describes circulating fluid in one direction through a loop of tubing to facilitate de-icing the engine. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Martin

Claims 9-12 depend, directly or indirectly, from independent Claim 6. When the recitations of Claims 9-12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claims 9-12 likewise are patentable over Martin.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 6 and 9-12 be withdrawn.

The rejection of Claims 1, 2, 4-7, and 9-18 under 35 U.S.C. § 102(6) as being unpatentable over Kroon (U.S. Patent No. 2,474,258) is respectfully traversed.

Kroon describes a turbine engine including a lubricating oil system that is used to lubricate the front, intermediate, and rear bearings 15, 33, and 34, respectively. The lubricating oil system includes a reservoir 37 that is positioned about an air inlet portion 14 of the turbine engine, and a lubricating pump 38 that is positioned in flow communication between the reservoir and the bearings. The pump withdraws oil from the reservoir via a suction conduit 39 and discharges the oil through a plurality of supply conduits 40, 41, and 42 to the front, intermediate, and rear bearings, respectively. After lubricating and cooling the bearings, the oil is collected and channeled through a plurality of conduits 43, 44, and 45 to a scavenging pump 46. The scavenging pump discharges routes the oil through a conduit 47 to a plurality of hollow guide vanes 16 to facilitate preventing ice formation along the vanes. The spent oil is then routed back to the reservoir.

Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

Kroon does not describe nor suggest a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, Kroon does not describe nor suggest coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface. Rather, in contrast to the present

invention, Kroon describes a lubricating oil system wherein oil is circulated in one direction through the system to provide lubrication to bearings and to facilitate preventing the formation of ice during engine operation. Accordingly, Claim 1 is submitted to be patentable over Kroon.

Claims 2, 4, and 5 depend, directly or indirectly, from independent Claim 1. When the recitations of Claims 2, 4, and 5 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claims 2, 4, and 5 likewise are patentable over Kroon.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Kroon does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Kroon does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Kroon describes a lubricating oil system wherein oil is circulated in one direction through the system to provide lubrication to bearings and to facilitate preventing the formation of ice during engine operation. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Kroon.

Claims 7 and 9-12 depend, directly or indirectly, from independent Claim 6. When the recitations of Claims 7 and 9-12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claims 7 and 9-12 likewise are patentable over Kroon.

Claim 13 recites a gas turbine engine comprising "a stator assembly...an ice protection system comprising at least one heat pipe coupled in thermal communication between said heat source and said stator assembly outer surface...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation."

Kroon does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 13. More specifically, Kroon does not describe nor suggest at least one heat pipe coupled in thermal communication with a stator assembly outer surface, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Kroon describes a lubricating oil system wherein oil is circulated in one direction through the system to provide lubrication to bearings and to facilitate preventing the formation of ice during engine operation. For at least the reasons set forth above, Claim 13 is submitted to be patentable over Kroon.

Claims 14-18 depend, directly or indirectly, from independent Claim 13. When the recitations of Claims 14-18 are considered in combination with the recitations of Claim 13, Applicants submit that dependent Claims 14-18 likewise are patentable over Kroon.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 2, 4-7, and 9-18 be withdrawn.

The rejection of Claims 1, 5, 6, and 12 under 35 U.S.C. § 102(b) as being unpatentable over Laing (U.S. Patent No. 3,978,660) is respectfully traversed.

Laing describes a gas turbine engine including a pair of axially-spaced annular heat exchangers 12 and 13. The heat exchangers consist of tubes 17 and 17' having substantially parallel axes. The tubes are coupled together in flow communication at their outlying ends by rotary annular chambers 18 and 18', and with channels 15 and 16 at their opposite ends. The channel system is filled with a thermally, stable liquid which is circulated during engine operation and used to transfer heat from the exhaust gases to the compressor air to facilitate improving engine efficiency.

Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

Laing does not describe nor suggest a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, Laing does not describe nor suggest coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface. Rather, in contrast to the present invention, Laing describes circulating fluid through a pair of heat exchangers to facilitate improving turbine efficiency. Accordingly, Claim 1 is submitted to be patentable over Laing.

Claim 5 depends from independent Claim 1. When the recitations of Claim 5 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 5 likewise is patentable over Laing.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Laing does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Laing does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Laing describes circulating fluid through a pair of heat exchangers to facilitate improving turbine efficiency. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Laing.

Claim 12 depends from independent Claim 6. When the recitations of Claim 12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claim 12 likewise is patentable over Laing.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 5, 6, and 12 be withdrawn.

The rejection of Claims 1, 4-6, and 9-17 under 35 U.S.C. § 102(b) as being unpatentable over Pravda (U.S. Patent No. 6,321,908) is respectfully traversed.

Pravda describes a gas turbine engine including a hollow turbine rotor 80 that includes a plurality of hollow blades 81, 82, and 83. The engine also includes a hollow compressor rotor 84 that includes a plurality of hollow blades 85-89. The two rotors are coupled together in flow communication with a hollow cylinder 90. A syphon tube 91 connects the turbine rotor blades to the compressor blades through the hollow cylinder. During engine operation, the syphon tube enables heat from the exhaust gases to heat the compressed incoming air used to drive the turbine rotor, such that turbine efficiency is facilitated to be improved. More specifically, during operation, vapor flows through the syphon tube from the turbine rotor blades to the compressor rotor blades, and condensed liquid flows from the compressor rotor through the hollow cylinder to the turbine rotor for reheating.

Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

Pravda does not describe nor suggest a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, Pravda does not describe nor suggest coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface. Rather, in contrast to the present

invention, Pravda describes circulating fluid in one direction through a syphon tube to facilitate improving turbine efficiency. Accordingly, Claim 1 is submitted to be patentable over Laing.

Claim 5 depends from independent Claim 1. When the recitations of Claim 5 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 5 likewise is patentable over Pravda.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

Pravda does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Pravda does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Pravda describes circulating fluid in one direction through a syphon tube to facilitate improving turbine efficiency. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Pravda.

Claims 9-12 depend, directly or indirectly, from independent Claim 6. When the recitations of Claims 9-12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claims 9-12 likewise are patentable over Pravda.

Claim 13 recites a gas turbine engine comprising "a stator assembly...an ice protection system comprising at least one heat pipe coupled in thermal communication between said heat source and said stator assembly outer surface...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation."

Pravda does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 13. More specifically, Pravda does not describe nor suggest at least one heat pipe coupled in thermal communication with a stator assembly outer surface, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. Rather, in contrast to the present invention, Pravda describes circulating fluid in one direction through a syphon tube to facilitate improving turbine efficiency. For at least the reasons set forth above, Claim 13 is submitted to be patentable over Pravda.

Claims 14-17 depend, directly or indirectly, from independent Claim 13. When the recitations of Claims 14-17 are considered in combination with the recitations of Claim 13, Applicants submit that dependent Claims 14-17 likewise are patentable over Pravda.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 4-6, and 9-17 be withdrawn.

The rejection of Claims 1, 5, 6, 11, and 12 under 35 U.S.C. § 102(b) as being unpatentable over Matsunaga (U.S. Patent No. 6,510,684) is respectfully traversed.

Matsunaga describes a gas turbine engine E including a centrifugal compressor 17 for compressing air, an air passage 28 for channeling compressed air to a burner 19, and a centrifugal turbine 18 driven by combustion gases generated in the burner. The compressor

and the turbine are rotatably coupled together, and are axially-spaced apart, via a rotor shaft 14. A thermal insulator or heat pipe unit 25 is positioned between the turbine and the compressor. The heat pipe unit includes a plurality of heat pipes 33 that extend radially around the rotor shaft. Radially inner portions of the heat pipes, positioned between the turbine and the compressor form evaporation sections 33a. Radially outer portions of the heat pipes extending through the compressed air passage form condensation sections 33b. During operation, the heat of the turbine is transmitted to the evaporation sections of the heat pipes such that fluid contained within the heat pipes is vaporized. The vapor is then channeled through the condensation sections of the heat pipes wherein the heat transfer between the heat pipes and the air passing through the compressed air passages heats the air, causing the vapor to condense within the heat pipes. The condensed liquid is then returned through the heat pipes to the evaporation sections of the heat pipes. Notably, Matsunaga describes at column 5, lines 49-54 that heating the air within the air passage facilitates enhancing the combustion efficiency in the burner.

Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

Matsunaga does not describe nor suggest a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, Matsunaga does not describe nor suggest coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source to facilitate preventing ice accumulation on the engine

component outer surface. Rather, in contrast to the present invention, Matsunaga describes that the condensation sections of a heat pipe are coupled in flow communication within an air passage to heat the air within the air passage to facilitate enhancing the combustion efficiency in the burner. Moreover, Matsunaga does not describe nor suggest using a heat pipe to facilitate preventing ice accumulation on the turbine engine during engine operation. Accordingly, Claim 1 is submitted to be patentable over Matsunaga.

Claim 5 depends from independent Claim 1. When the recitations of Claim 5 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 5 likewise is patentable over Matsunaga.

Claim 6 recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...said ice protection system facilitates at least one of preventing and mitigating ice accretion across the engine component outer surface."

Matsunaga does not describe nor suggest an ice protection system for a turbine engine as is recited in Claim 6. More specifically, Matsunaga does not describe nor suggest at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the ice protection system facilitates at least one of preventing and mitigating ice accretion across the engine component outer surface. Rather, in contrast to the present invention, Matsunaga describes that the condensation sections of a heat pipe are coupled in flow communication within an air passage to heat the air within the air passage to facilitate enhancing the combustion efficiency in the burner. Moreover, Matsunaga does not describe nor suggest using a heat pipe to facilitate preventing or mitigating ice accretion

across the outer surface of the engine component. For at least the reasons set forth above, Claim 6 is submitted to be patentable over Matsunaga.

Claims 11 and 12 depend, directly or indirectly, from independent Claim 6. When the recitations of Claims 11 and 12 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claims 9-12 likewise are patentable over Matsunaga.

For at least the reasons set forth above, Applicants respectfully request that the Section 102 rejection of Claims 1, 5, 6, 11, and 12 be withdrawn.

The rejection of Claims 3, 8, and 19 under 35 U.S.C. § 103(a) as being unpatentable over any of the above prior art (e.g., Kroon) in view of Moskowitz et al. (U.S. Pat. No. 3,756,020) is respectfully traversed.

Moskowitz et al. describe a gas turbine engine which includes a plurality of stator vanes and rotor blades 14 that are cooled internally by fluid circulated within a closed system. The circulation system includes an annular intake manifold 47 and an annular outlet manifold 48. A plurality of inlet tubes 52 and outlet tubes 53 extend radially inwardly from their respective manifolds. These tubes form a heat exchanger portion 16 of the stator assembly. Fluid circulated through the circulation system facilitates maintaining an operating temperature of the stator and rotor blades, thus improving the specific fuel consumption of the engine, such that less fuel is required to maintain a given inlet temperature and a given power output.

Applicants respectfully submit that the Section 103 rejection of the presently pending claims is not a proper rejection. Applicants respectfully submit that the Section 103 rejection of presently pending Claims 3, 8, and 19 is not a proper rejection. Obviousness cannot be established by merely suggesting that it would have been an obvious to one of ordinary skill in the art to combine any of the cited art with Moskowitz et al. More specifically, it is respectfully submitted that a prima facie case of obviousness has not been established. As explained by the Federal Circuit, "to establish obviousness based on a combination of the elements disclosed in the prior art, there must be some motivation, suggestion or teaching of

the desirability of making the specific combination that was made by the Applicant." In re Kotzab, 54 USPQ2d 1308, 1316 (Fed. Cir. 2000). MPEP 2143.01.

Moreover, as is well established, the mere fact that the prior art structure could be modified does not make such a modification obvious unless the prior art suggests the desirability of doing so. *See* In re Gordon, 221 U.S.P.Q.2d 1125 (Fed. Cir. 1984). Furthermore, the Federal Circuit has determined that:

> [i]t is impermissible to use the claimed invention as an instruction manual or "template" to piece together the teachings of the prior art so that the claimed invention is rendered obvious. This court has previously stated that "[o]ne cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention."

In re Fitch, 23 USPQ2d 1780, 1784 (Fed. Cir. 1992). Further, under Section 103, "it is impermissible . . . to pick and choose from any one reference only so much of it as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art." In re Wesslau, 147 USPQ 391, 393 (CCPA 1965). Rather, there must be some suggestion, outside of Applicants' disclosure, in the prior art to combine such references, and a reasonable expectation of success must be both found in the prior art, and not based on Applicants' disclosure. In re Vaeck, 20 U.S.P.Q.2d 1436 (Fed. Cir. 1991). In the present case, neither a suggestion nor motivation to combine the cited art, nor any reasonable expectation of success has been shown. Accordingly, since there is no teaching nor suggestion in the cited art for the claimed combination, the Section 103 rejection appears to be based on a hindsight reconstruction in which isolated disclosures have been picked and chosen in an attempt to deprecate the present invention. Of course, such a combination is impermissible, and for this reason alone, Applicants request that the Section 103 rejection of Claims 3, 8, and 19 be withdrawn.

Moreover, if art "teaches away" from a claimed invention, such a teaching supports the nonobviousness of the invention. U.S. v. Adams , 148 USPQ 479 (1966); Gillette Co. v. S.C. Johnson & Son, Inc., 16 USPQ2d 1923, 1927 (Fed. Cir. 1990). In light of this standard,

it is respectfully submitted that the cited art, as a whole, is not suggestive of the presently claimed invention. Specifically, Applicants respectfully submit that Moskowitz et al. and the remaining cited art, teach away from the present invention, and as such, thus supports the nonobviousness of the present invention. More specifically, as described above, none of the cited art or Moskowitz et al. describe or suggest an ice protection system for a turbine engine, wherein the ice protection system includes at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component, wherein the heat pipe has a first end, a second end, and a body extending therebetween, the heat pipe body enables fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation.

In addition, no combination of the cited art and Moskowitz et al. describes or suggests the claimed invention. Specifically, Claim 1 recites a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation, wherein the method comprises "coupling at least one heat pipe to the engine such that a first end of the at least one heat pipe is coupled in thermal communication with a heat source...coupling a second end of the at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface.

No combination of the prior art and Moskowitz et al. describes or suggests a method for assembling a turbine engine to facilitate preventing ice accumulation on the turbine engine during engine operation as is recited in Claim 1. More specifically, no combination of the prior art and Moskowitz et al. describes or suggests coupling at least one heat pipe in thermal communication with an outer surface of an engine component that is upstream from the heat source, such that fluid flows from the first end to the second end of the at least one

heat pipe, and in an opposite flow direction from the second end to the first end of the least one heat pipe through the at least one heat pipe to facilitate preventing ice accumulation on the engine component outer surface. Accordingly, Claim 1 is submitted to be patentable over the cited art in view of Moskowitz et al.

Claim 3 depends from independent Claim 1. When the recitations of Claim 3 are considered in combination with the recitations of Claim 1, Applicants submit that dependent Claim 3 likewise is patentable over the cited art in view of Moskowitz et al.

Claim 8 depends from Claim 6 which recites an ice protection system for a turbine engine, wherein the ice protection system comprises "at least one heat pipe coupled in thermal communication between a heat source and an outer surface of at least one engine component...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation...."

No combination of the prior art and Moskowitz et al. describes or suggests an ice protection system for a turbine engine as is recited in Claim 6. More specifically, no combination of the prior art and Moskowitz et al. describes or suggests at least one heat pipe coupled in thermal communication with an outer surface of an engine component, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. For at least the reasons set forth above, Claim 6 is submitted to be patentable over the cited art in view of Moskowitz et al.

Claim 8 depends from independent Claim 6. When the recitations of Claim 8 are considered in combination with the recitations of Claim 6, Applicants submit that dependent Claim 8 likewise is patentable over the cited art in view of Moskowitz et al.

Claim 13 recites a gas turbine engine comprising "a stator assembly...an ice protection system comprising at least one heat pipe coupled in thermal communication between said heat source and said stator assembly outer surface...said at least one heat pipe comprises a first end, a second end, and a body extending therebetween, said body has a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation."

No combination of the prior art and Moskowitz et al. describes or suggests an ice protection system for a turbine engine as is recited in Claim 13. More specifically, No combination of the prior art and Moskowitz et al. describes or suggests at least one heat pipe coupled in thermal communication with a stator assembly outer surface, wherein the heat pipe includes a first end, a second end, and a body extending therebetween and having a cross-sectional flow area that is sized to enable fluid to flow in a first direction from the first end to the second end therethrough and in a second direction from the second end to the first end therethrough during engine operation. For at least the reasons set forth above, Claim 13 is submitted to be patentable over the cited art in view of Moskowitz et al.

Claim 19 depends from independent Claim 13. When the recitations of Claim 19 are considered in combination with the recitations of Claim 13, Applicants submit that dependent Claim 19 likewise is patentable over the cited art in view of Moskowitz et al.

For at least the reasons set forth above, Applicants respectfully request that the Section 103 rejection of Claims 3, 8, and 19 be withdrawn.

In view of the foregoing remarks, all the claims now active in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited.

Respectfully Submitted,

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